MULTIMEDIA UNIVERSITY

STUDENT IDENTIFICATION NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2018/2019

BMT1814 – MANAGERIAL MATHEMATICS

(All Sections / Groups)

15 OCTOBER 2018
9.00 a.m. - 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 6 pages, inclusive of a list of formulae.
2. Attempt all 4 questions. The distribution of marks for each question is given.
3. Students are allowed to use scientific calculators.
4. Please write your answers in the **Answer Booklet** provided.

Question 1 (25 marks)

a) Write a linear equation where its graph passes through the points $(-3,-5)$ and $(7,15)$.

[5 marks]

b) Solve the real value of x for the following equation.

$$x+\frac{1}{5}=\frac{x}{2}-3$$

[4 marks]

c) A manufacturer produces two types of DVD player: Ace and Brace. During production, the players require the use of two machines, machine 1 and machine 2. The numbers of hours needed on both machines are indicated in the following table:

DVD Player	***Machine***	
	1	**2**
Ace	1	2
Brace	3	2
Work-Hours Available	**24**	**24**

If each machine can be used 24 hours a day, and the profits on the Ace and Brace models are RM50 and RM80, respectively, how many of each type of player should be made per day to obtain the maximum profit? What is the maximum profit?
Solve the problem using linear programming by graph and corner-point method.

[16 marks]

Question 2 (25 marks)

a) Alexandra is the beneficiary of a trust fund established for her 21 years ago at her birth. If the original amount placed in trust was RM10,000, how much will she receive if the money earned interest at the rate of 8% per year compounded quarterly?

[7 marks]

b) Find the nominal interest rate needed for an investment of RM5000 to grow to an amount of RM6000 in 3 years if interest is compounded semi-annually.

[8 marks]

c) Aries Landscaping Company wants to build a RM250,000 greenhouse in 36 months. The company sets up a sinking fund with payments made quarterly. Find the quarterly payment into this fund if the money earns 5% compounded monthly.

[5 marks]

Continued....

d) Naqib buy a car with a down payment of RM300 and payments of RM200 per month for 3 years. If the interest rate is 4% compounded monthly, what is the total cost of his car?

[5 marks]

Question 3 (25 marks)

a) Find the derivatives of the following functions

(i) $f(x) = 4x^5 + 3x^4 - 8x^2 + x + 3$

[3 marks]

(ii) $y = \frac{3}{x^3} + \frac{4}{\sqrt{x}} + 1$

[3 marks]

(iii) $f(x) = x^3\left(\sqrt{x} + 1\right)$

[4 marks]

b) A group of marine biologist at the Atlantic Institute of Oceanography recommended that a series of conversation measures can be carried out over the next decade to save a certain species of great white shark from extinction. After implementation of the conversation measures, the population of this species is expected to follow the equation

$$Y(t) = 3t^3 + 2t^2 - 10t + 600 \quad 0 \le t \le 10$$

Where $Y(t)$ denotes the population at the end of year t. Find the rate of growth of the great white shark population when $t = 2$ and $t = 6$. How large will the great white shark population be 8 years after implementing the conversation measures?

[5 marks]

c) Suppose the relationship between the unit price p in dollars and the quantity demanded x of the Ultrasonic model F loudspeaker system is given by the equation

$$p = -0.02x + 400 \quad 0 \le x \le 20000$$

(i) Find the revenue function R.

[2 marks]

(ii) Find the marginal revenue function R'.

[1 marks]

(iii) Compute $R'(2000)$, and interpret your result.

[2 marks]

Continued....

d) For the following function: $f(x,y) = 2x^2 - 4xy + y^4 + 2x - y$

(i) Find the first partial derivatives, f_x and f_y.

[3 marks]

(ii) Compute $f_x(2,3)$ and $f_y(2,3)$.

[2 marks]

Question 4 (25 marks)

a) Integrate the following functions:

(i) $\int\left(2x + \frac{3}{x} + \frac{4}{x^2}\right) dx$ **[3 marks]**

(ii) $\int\left(2e^x - x^3\right) dx$ **[3 marks]**

(iii) $\int_1^2 1 + \frac{1}{x} + e^x dx$ **[5 marks]**

b) Solve the following indefinite integral using integration by substitution:

$$\int 3t^2\sqrt{t^3 + 2}dt$$

[6 marks]

c) Find the area bounded by the graph $f(x) = x + 3x^2$, the x-axis and the line $x = 4$ to $x = 8$.

[8 marks]

End of page.

LIST OF FORMULAE

Linear & Quadratic Equation

1. **Quadratic Equation**

Solution of quadratic equation : $ax^2 + bx + c = 0$ are

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Mathematics For Finance

1. **Simple Interest**

Interest, I = Prt

Accumulated amount, A = P (1 + rt) or A = P + I

2. **Compound Interest**

$A = P(1 + i)^n$ where $i = \frac{r}{m}$ and $n = mt$

3. **Effective Rate of Interest**

$$r_{eff} = \left(1 + \frac{r}{m}\right)^m - 1$$

4. **Present Value for Compound Interest**

$$P = A(1+i)^{-n}$$

5. **Annuity**

$$S = R\left[\frac{(1+i)^n - 1}{i}\right] \qquad P = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$

6. **Amortization**

$$R = \left[\frac{Pi}{1-(1+i)^{-n}}\right]$$

7. **Sinking Fund**

$$R = \left[\frac{iS}{(1+i)^n - 1}\right]$$

Derivative

Basic Rules of Differentiation

a) Derivative of a constant: $\frac{d}{dx}(c)=0$

b) Power rule: $\frac{d}{dx}(x^n)=nx^{n-1}$

c) Sum rule: $\frac{d}{dx}[f(x)\pm g(x)]=\frac{d}{dx}[f(x)]\pm\frac{d}{dx}[g(x)]$

a) Product rule: $\frac{d}{dx}[f(x)\bullet g(x)]=\frac{d}{dx}[f(x)]g(x)+\frac{d}{dx}[g(x)]f(x)$

b) Quotient rule: $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right]=\frac{g(x)\bullet\frac{d}{dx}[f(x)]-f(x)\bullet\frac{d}{dx}[g(x)]}{[g(x)]^2}$

c) Chain rule: $\frac{dy}{dx}=\frac{dy}{du}\bullet\frac{du}{dx}$

d) General Power rule: $\frac{d}{dx}[u^n]=nu^{n-1}\frac{d}{dx}u$

e) Logarithmic function: $\frac{d}{dx}(\ln u)=\frac{1}{u}\left(\frac{du}{dx}\right)$

f) Exponential function: $\frac{d}{dx}(e^u)=e^u\frac{du}{dx}$

Integration

Basic Rules of Integration

a) Indefinite integral of a constant: $\int k\,du = ku + C$

b) Power rule: $\int u^n\,du = \frac{u^{n+1}}{n+1}+C$

c) Sum rule: $\int [f(u) \pm g(u)]\,du = \int f(u)\,du \pm \int g(u)\,du$

d) Logarithmicfunction: $\int \frac{1}{u}du = \ln u + C$

e) Exponentialfunction: $\int e^u\,du = e^u + C$

Calculus of Several Variables

1. **Determining Relative Extrema**

$D(x,y) = f_{xx}f_{yy} - f_{xy}^{\ 2}$

D(a,b)	$f_{xx}(a,b)$	Interpretation
+	+	Relative min. at (a,b)
+	–	Relative Max. at (a,b)
–		Neither max. or min. at (a,b)
0		Test is inconclusive

Others

1. **Average Cost Function**
   $\overline{C} = \frac{C(x)}{x}$

2. **Marginal Average Cost Function**
   $\overline{C}'(x)$